GRASSY HILL RD—JAMESTOWN RD

FRANKLIN COUNTY, VIRGINIA

Letter Health Consultation

January 11, 2018

Virginia Department of Health
Division of Environmental Epidemiology
109 Governor Street
Richmond, Virginia 23219

COMMONWEALTH of VIRGINIA

DEPARTMENT OF HEALTH

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January 11, 2018

David M. Miles, C.P.G.
Regional Petroleum Program Manager
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Roanoke, Virginia

Dear Mr. Miles:

Virginia Department of Health (VDH) was notified by the Department of Environmental Quality (DEQ) that some residential wells along Grassy Hill Road and Jamestown Road in Franklin County have been found to be contaminated by organic chemicals consistent with a past gasoline leak. A nearby gas station had underground storage tanks removed in 1998; however, it is not known if this is the source. To address resident concerns, water test results were provided to the Virginia Department of Health (VDH) to determine whether there might be potential health effects. Through a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR) the samples collected on December 14th, 2017 have been evaluated for public health implications.

BACKGROUND

Following the discovery of the groundwater contamination, well water from nearby residences was tested and water filtration systems were installed to reduce gasoline components to below detectable limits. Results from two residences were supplied to VDH after residents expressed concern about the findings. In this letter these residences will be identified by the numeric prefix on the supplied lab report. The chemicals detected in these wells are given in Table 1 with their comparison values (CV). Where several health-based CVs were available (cancer and non-cancer), the most health protective value was used for each chemical.

Table 1. Chemicals detected in residential well water, December 14, 2017

Chemicals Detected	***Concentration at Residence (µg/L[1])***		***Comparison Value (µg/L)***	
	16238	**16258**	Value	Type
Volatile Organic Compounds				
Benzene	**4.3**[2]	ND[3]	0.44	CREG[4]
1,2-Dichloroethane	**6.4**	ND	0.27	CREG
Methyl *tert*-butyl ether (MTBE)	4.9	3.0	2,100	Child intermediate EMEG[5]
Naphthalene	*0.6*[6]	ND	140	Child chronic RMEG[7]
Xylenes, total	*1.4*	*1.0*	1,400	Child chronic EMEG[8]
Semi-volatile Organic Compounds				
Naphthalene	*1.1*	ND	140	Child chronic RMEG

1. Micrograms per liter
2. Values in bold exceed the corresponding CV.
3. ND: Not detected
4. Cancer risk evaluation guide
5. Child intermediate environmental media evaluation guide
6. Concentrations of results in italics are estimated.
7. Child chronic reference media evaluation guide
8. Child chronic environmental media evaluation guide

DISCUSSION

No chemicals were found to exceed non-cancer health effect CVs in **Residence #16238** or **Residence #16258** drinking well water. Two chemicals exceeded their cancer health effect CVs for **Residence #16238**, benzene and 1,2-dichloroethane. Benzene is a well-known human carcinogen, and is associated with leukemia and other bone marrow cancers. 1,2-Dichloroethane is not known to cause cancer in humans, but is considered a probable human carcinogen since it can cause tumors in laboratory rats.

CVs are media-specific concentrations used to identify contaminants that require additional evaluation. They are derived using standard default exposure assumptions and are not site-specific. For contaminants detected below their respective CVs, exposure is not anticipated to result in adverse health effects. Concentrations above CVs do not mean that adverse health effects occurred or will occur, but that further investigation is needed. Therefore, the CVs should not be used to predict the occurrence of adverse health effects.

Cancer risk evaluation guidelines (CREG) are established with an assumption of exposure to the carcinogen over a period of 70 years. Cancer risks calculated based upon the CREG may be overly protective if the actual exposure is a shorter period of time.

For **Residence #16238** the calculated increased cancer risk from drinking well water with the reported 4.3 micrograms per liter (µg/L) concentration of benzene is 0.19×10^{-6} to 6.9×10^{-6}, and the calculated increased cancer risk from drinking well water with the reported 6.4 µg/L concentration of 1,2-dichloroethane is 17×10^{-6} (see Appendix A: Calculations).

In practical terms this means that if a million people drank well water with these concentrations over a lifespan of 70 years, up to 7 of them might develop cancer from benzene exposure, and 17 of them might develop cancer from 1,2-dichloroethane exposure. Regulatory agencies consider an excess cancer risk between one in ten thousand and one in a million to be acceptable. Therefore, the additional cancer risk is considered very low.

Concentrations of the chemicals methyl *tert*-butyl ether (MTBE) and total xylenes detected in well water for **Residence #16258** were below their corresponding comparison value (CV) of 2,100 µg/L for MTBE and 1,400 µg/L for total xylenes.

CONCLUSIONS

VDH concludes that concentrations of chemicals in well water at **Residence #16238** are not a health hazard, because the calculated cancer risk is within the acceptable range and the concentrations are below non-cancer health effect comparison values.

VDH concludes that the chemicals detected in well water for **Residence #16258** are not a health hazard because their concentrations are below their corresponding comparison values.

LIMITATIONS

Since both benzene and 1,3-dichloroethane are volatile, when these are present in well water a resident may be exposed to small amounts via inhalation while showering or during other water use. This exposure is not included in the cancer oral unit risk factor and is not expected to not have an appreciable additional impact on health.

Well water contamination concentrations were measured for one point in time, and it is impossible to tell how long the wells were contaminated or what past concentrations of organic chemicals might have been.

RECOMMENDATIONS

VDH recommends residents continue to use the carbon filtration units installed until the ground water has been remediated or a safe, reliable alternate drinking water source is established.

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APPENDIX A: CALCULATIONS

$$Concentration \times unit\ risk\ factor = Cancer\ risk$$

Cancer risk from benzene in drinking water at 4.3 µg/L

Oral cancer unit risk range: 4.4×10^{-7} to 1.6×10^{-6}/µg/L

$$4.3\ \mu g/L \times \frac{4.4 \times 10^{-7}}{\mu g/L} = \mathbf{0.19 \times 10^{-6}\ minimum}$$

$$4.3\ \mu g/L \times \frac{1.6 \times 10^{-6}}{\mu g/L} = \mathbf{6.9 \times 10^{-6}\ maximum}$$

Cancer risk from 1,2-dichloroethane in drinking water at 6.4 µg/L

Oral cancer unit risk: 2.6×10^{-6}/µg/L

$$6.4\ \mu g/L \times \frac{2.6 \times 10^{-6}}{\mu g/L} = \mathbf{17 \times 10^{-6}}$$